HYCON MODEL 73-C CAMERA SYSTEM

RADIO INTERFERENCE SUPPRESSION

WORK PLAN

25 October 1957

1.0 INTRODUCTION

1.1 Subject. The subject with which this work plan is concerned is the radio noise interference which is created by the 73-C Configuration.

1.2 Purpose. It is intended that this work plan be a systematic and logical approach to the problem of radio interference in the 73-C. It is not meant to be a rigid plan, but one which presents a framework for the systematic solution of each problem.

1.3 Scope. Basically, the intention is to detail a procedure of testing, correction, performance testing, and evaluation. An appendix is attached which outlines briefly the general problem of radio interference.

2.0 DESCRIPTION OF THE PROBLEM

2.1 Radio Interference. Specifically, the 73-C Configuration generates noise which interferes with the aircrafts radio and ADF equipment.

2.2 Mode of Propogation. Two modes exist: conduction and radiation. It is expected that both modes will be encountered.

2.3 Frequency Range. The frequency range of interference with which we are concerned extends from 150 KC to 400 MC.

2.4 Permissible Levels. The level to which the radio interference is to be reduced shall be defined as the level which permits the aircraft's radio equipment to perform satisfactorily. This shall be determined by Hycon engineers in cooperation with the aircraft personnel concerned.

3.0 PROCEDURES.

3.1 Testing.

3.1.1 All units of the 73-G Configuration which are suspected of being interference sources are to be tested by either the radio noise facilities of Cornel-Dubilier (or similar facilities) or by our own RF (G.F.E.) receiver.

3.1.2 It shall be the function of the above test to determine the sources of radio interference, the interference level associated with each source, and to find filter devices and/or develop techniques which will reduce the level of interference.

3.2 Correction.

3.2.1 The results of the testing described in 3.1 will indicate the correct means of reducing the interference.

3.2.2 Units which are prime offenders will be modified first and tested as outlined in 3.3.

3.2.3 It is anticipated that in the majority cases, the radio interference will be reduced adequately by the use of:

1) Filters.

2) Arc suppression devices.

3) Shielding.

4) Improved Bonding.

3.2.4 All corrective work shall be accomplished at Hycon Plant #9 under the supervision of the engineers responsible for the particular units.

3.3 Performance Testing

3.3.1 Each modified unit will be taken to the Test Site and installed in the 73-C Configuration.

3.3.2 The Configuration will be installed in the aircraft and operated in conjunction with the radio equipment.

3.3.3 A qualitative comparison of the interference levels and an evaluation of the improvement of the levels by the modification of each unit will be made at this time.

3.3.4 Further testing and improvement will depend upon the performance of the modified units as determined by a flight test.

Progress Report No. 1

RADIO INTERFERENCE SUPPRESSION

WORK PLAN

24 October 1957

1. TESTS PERFORMED.

1.1 Units Tested As of this date, the following units have been tested by the radio noise facilities at Cornel-Dubilier Electric Corp., Venice, California.

1.	Gyro Sensor Assembly	Part No. 733895
2.	Film Take-Up Motor	Part No. 734360
3.	Aperture Motor	Part No. 733273
4.	Tension Regulator Motor	Part No. 734181
5.	Film Drive Motor	Part No. 733646
6.	Oblique Drive Motor	Part No. 733676
7.	Main Junction Box	Part No. 734120
8.	Film Drive Servo	Part No. 733640
9.	Oblique Drive Servo	Part No. 733670
10.	Stabilizer Servo	Part No. 733870
11.	Programmer	Part No. 733600
12.	Stabilizer Power Supply	Part No. 733885

Items 7, 8, 9, and 10 above comprise the Electrical Rock.

1.2 Conditions of Testing The radio interference testing facilities at Cornell-Dubilier Electric Corp., are designed and equipped to conform with the environmental requirements of Mil-I-6181B. In brief, this means the tests were performed in a screened room with no detectable interference present; the equipment being tested was mounted on a ground plane of specified minimum dimensions and properly bonded to the screen room; the equipment was bonded properly to the ground plane; line stabilization networks were utilized on the power lines; and AN-type radio interference measuring sets were used for quanitative results.

2.0 TEST RESULTS.

2.1 The units which were determined to be prime sources of radio interference were:

1. Film Take-Up Motor
2. Aperture Motor

2.1 (cont'd)

3. Tension Regulator Motor
4. Film Drive Motor
5. Oblique Drive Motor
6. Programmer
7. Gyro Sensor Assembly

The order of the above list is not intended to indicate the magnitude of the radio interference emitted by each unit.

2.2 Recommendations. With the exception of the Gyro Sensor Assembly, which did not receive further testing, filter devices were tested and techniques recommended by Cornell-Dubilier for all other units listed above.

2.3 Levels After Filtering. Although Mil-I-6181B specifications are intended to be used only as a guide, tests performed by Cornell-Dubilier indicate that all the motors can easily be modified to be well below the specified maximun levels of Mil-I-6181B. Tests on the Programmer (after filtering) indicate a substantially reduced level which should be adequate.

3.0 MODIFICATIONS

3.1 Motors The motors tested (i.e., the Film Drive, Film Take-Up, Aperture, Tension regulator). Have been modified as follows:

a. A filter, of the type recommended by Cornell-Dubilier, has been installed.
b. The units have been reworked to obtain better shielding. This has mainly been accomplished by use of shielded wire.
c. Great care has been taken to insure good bonding between surfaces to improve the electrical ground. Insulating layers, such as anodize, have been removed at the points of contact and the surface cleaned.

The direct purpose of the above modifications is to contain the radio interference within each unit and thereby prevent conduction and /or radiation to occur.

3.2 Programmer. A shielded box has been constructed upon which has been mounted twenty five filters. This filter assembly has been taken to the Test Site, mounted adjacent to the Programmer, and the filters inserted into the appropriate leads. The filters used were recommended by Cornell-Dubilier.

3.3 Gyro Sensor Assembly. The prime sources of radio interference in unit are the heater circuits of the gyros. A double RC network of our own design has been installed across the power connections each circuit of the unit in the 73-C Configuration at the Test Site.

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4.0 PERFORMANCE TEST.

4.1 Testing. The above modified parts were removed to the Test Site and installed in the 73-C Configuration there. Test procedures were carried out as outlined in the Work Plan, Section 3.3.

4.2 Test Result. After the configuration was installed the article was towed to a remote section of the flight line. The unit was operated in different Modes for half an hour while [redacted] aircraft radioman listened on various receiver channels for radio noise. His opinion was that the noise had been reduced to an amount that was barely noticiable and would present no receiving problem.

4.3 Flight Test. The 31 October 1957, Test Flight, of the 73-C will be used for a pilot's evaluation.

SECRET

TEST 1 OPTICAL & FIXED
TEST 2 OBLIQUE W/HAND CONTRO

DATE	FLT	OP TIME TOTAL	FLT TIME TOTAL	REMARKS	EST. RELIABILITY
21 Dec 56	1	0	2:36 2:36	1900 exposures. No pictures. Shutter stuck. Film fed o.k. Test #1	0
29 Jan 57	2	0	4:00 6:36	A.C. Power Switch Not On. Tension Sensor Switch Failed after 1150 ft. film. Out of 4000; Fixed Vertical Test #1	Not Scored
31 Jan	3	3:20 3:20	4:00 10:36	O.K. Flight. 3700' Film one lens needs adjusting. 3110 exposures.	100%
5 Feb	4	0:35 3:55	1:20 11:56	3600' run off. 100% reliable.	100%
12 Feb	5	3:30 7:25	4:10 16:06	3500' exposed. 3011 exposures. Not in Focus. Test #1	100%
14 Feb	6	2:55 10:20	3:35 19:41	Tilted Platen. X & Y plane Tilt. One spot in lower right corner in focus. Edge of mirror. Test #1	100%
Feb	7	0:25 10:45	1:05 20:46	Film left loaded for approx 24 hours. Film stuck to metering roller and tore causing jam. Test #1.	0%
2 Mar	8	2:07 12:52	2:47 23:33	Tilted platen. Estimated 10 lines/MM in good area on negative. Test #1	100%
5 Mar	9	4:05 16:57	4:35 28:08	Fixed vertical. No hand control operation. Tilted platen focus at alt. found to be .250 in. Different than on ground. This at limit of or beyond. Test #1 Limits of camera and collumator adjustment.	100%
6 Mar	10	2:01 18:58	2:41 30:49	Fixed and tilted platen. Test #1	100%

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NO CHANGE IN CLASS. X
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25X1

SECRET

SECRET

C CAMERA

DATE	FLT	OP TIME TOTAL	FLT TIME TOTAL	REMARKS	EST. RELIABILITY
25X1 26 Apr [redacted]	11	∿ 19:00 2:15 21:15	∿ 30:49 3:00 33:49	Mode 2 & 3 used O.K. IMC fixed 12 Exp. 4 Film transport O.K. CIR. BKR. popped during warm-up causing shutter failure . No photo	0
19 Jul [redacted]	12	2:55 24:10	3:40 37:29	Modes 1,2,3 used. Radio noise bad. Focus approx 1/4" front of platen.	100%
25X1 3 Aug [redacted]	13	1:10 25:20	1:55 39:24	Modes 1,2,3. Bad radio noise. Focus better than previous mission. Image movement.	100%
25X1 3 Aug [redacted]	14	1:00 26:20	1:45 41:09	Fixed vertical till over Bakersfield. Mode 2. Radio noise. Image front of platen .050" movement	100%
25X1 9 Aug [redacted]	15	3:15 29:35	4:00 45:09	Modes 2 & 3. Very bad radio noise. Had to turn camera off to transmit. Turned radio off when camera on. No info on focus	100%
25X1 15 Aug [redacted]	16	1:25 31:00	2:10 47:19	Modes 2 & 3. Radio noise bad. Bad in standby and very bad Modes 2 & 3 Caused by lens cone heat thermostat. Image motion predominately vertical.	100%
25X1 [redacted] Aug [redacted]	17	1:10 32:10	1:55 49:14	Modes 2 & 3. Radio noise very bad. No vibration. Focus very close. 15-20 resolution.	100%
8 Oct [redacted]	18	5:40 37:50	6:15 55:29	Modes 2 & 3. used. Considerable radio noise but decreased half way thru mission. Pilot alternated between modes 2 & 3 every ten minutes last half of mission. No drift sight.	100%
25X1					